LATE PREHISTORY OF THE NILE BASIN
AND THE SAHARA
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The Epipaleolithic-Neolithic transition in Egypt's Fayum Depression

Introduction

The general problem of the origins of agriculture in Egypt encompasses a complex set of related questions. When, for example, did the first domesticates appear in Egypt, and from where? What kinds of adaptations preceded agriculture? Were these pre-agricultural societies "converted" to agricultural economies or simply replaced by agricultural peoples moving into the Nile Valley and Delta? And, perhaps most important, what is there about the evolution of agricultural economies and village societies in Egypt that helps us understand this transition as it occurred in other parts of the world?

Egypt's Fayum Depression first served as a laboratory for investigations of these issues in the 1920s, when Caton-Thompson and Gardner (1934) excavated there and found evidence in support of the "Oasis Hypothesis" of agricultural origins, which had been proposed by Pumpelly (1908) and Childe (1952). Since that time other scholars have continued research on the Epipaleolithic-Neolithic transition in the Fayum (Puglisi 1967; Wendorf and Schild 1976; Ginter and Kozłowski 1983; Brewer 1986; Buck 1984; Wenke *et al.* 1983), and there has been important relevant research in other areas of Egypt as well (*e.g.* Wendorf and Schild 1980; Hassan *et al.* 1980; Hassan 1984).

Our work in the Fayum consisted of 6 months of archaeological survey and excavations during 1981 in the southwestern part of the Depression (Fig. 1). This region contains large scatters of artifacts, faunal remains, and other remnants of numerous Epipaleolithic ("Fayum B" or "Qarunian") and Neolithic ("Fayum A") occupations. We concentrated on this area partly because the archaeological sites in this region seemed similar in composition to those on the northern shore, where

most previous research had been conducted, yet these southern sites' relative inaccessibility had protected them from the looting that has severely damaged sites on the northern shore. Because we were interested in relating the Fayum data to general problems of agricultural origins in Egypt, we designed our fieldwork in such a way that we could estimate changes in settlement patterns and subsistence strategies from Epipaleolithic to Neolithic times. Thus we made extensive surface collections in a random sampling design (Fig. 2), so that we can study the spatial associations between hundreds of thousands of stone tools, pottery sherds, animal bones, and other debris.

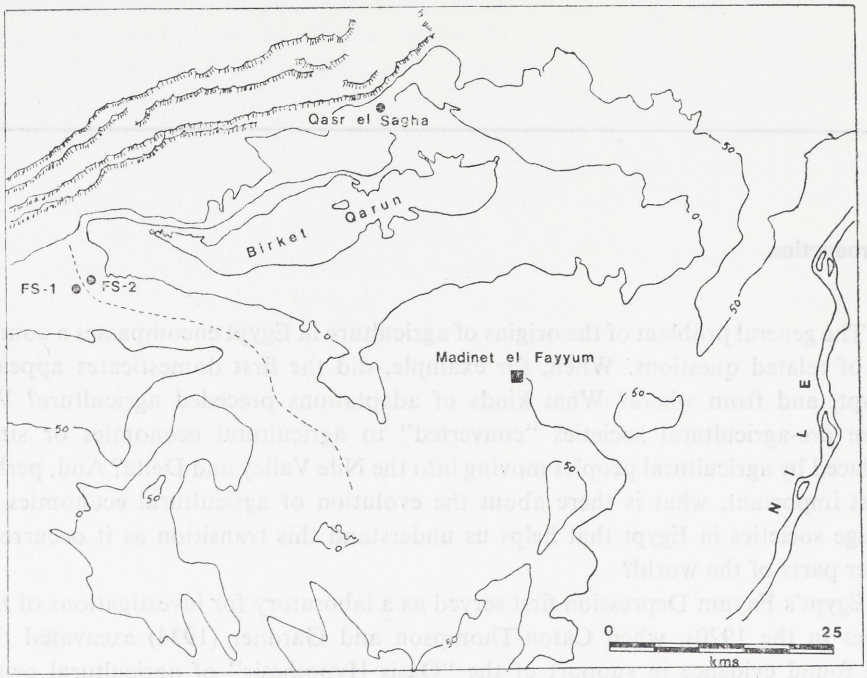

FIG. 1. The Fayum Oasis

FS-1 is an area of Neolithic occupations; FS-2 is composed of Epipalaeolithic occupations. They are separated by an ancient beach-ridge

Our objective in this paper is to relate our preliminary analyses of our data to previous and subsequent research in the Fayum, and to try to bring the whole of this information to bear on general questions pertaining to early agriculture in Egypt.

We are still analysing the hundreds of thousands of lithics, ceramics, floral and faunal remains, geological samples and other data recovered during the 1981 season. Thus our remarks here are necessarily somewhat tentative: most of our inferences cannot yet be supported with much quantified evidence and may be altered after additional analyses have been completed.

The theoretical context

Questions pertaining to the evolution of agricultural economies remain at the center of contemporary methodological and theoretical debates in archaeology. Indeed, conflicts between various schools of thought about the general nature of anthropological and historical inquiry have often been expressed most sharply in their treatment of agricultural origins (Flannery 1973; Binford 1968; Rindos 1984; Hassan 1981: 209 - 221).

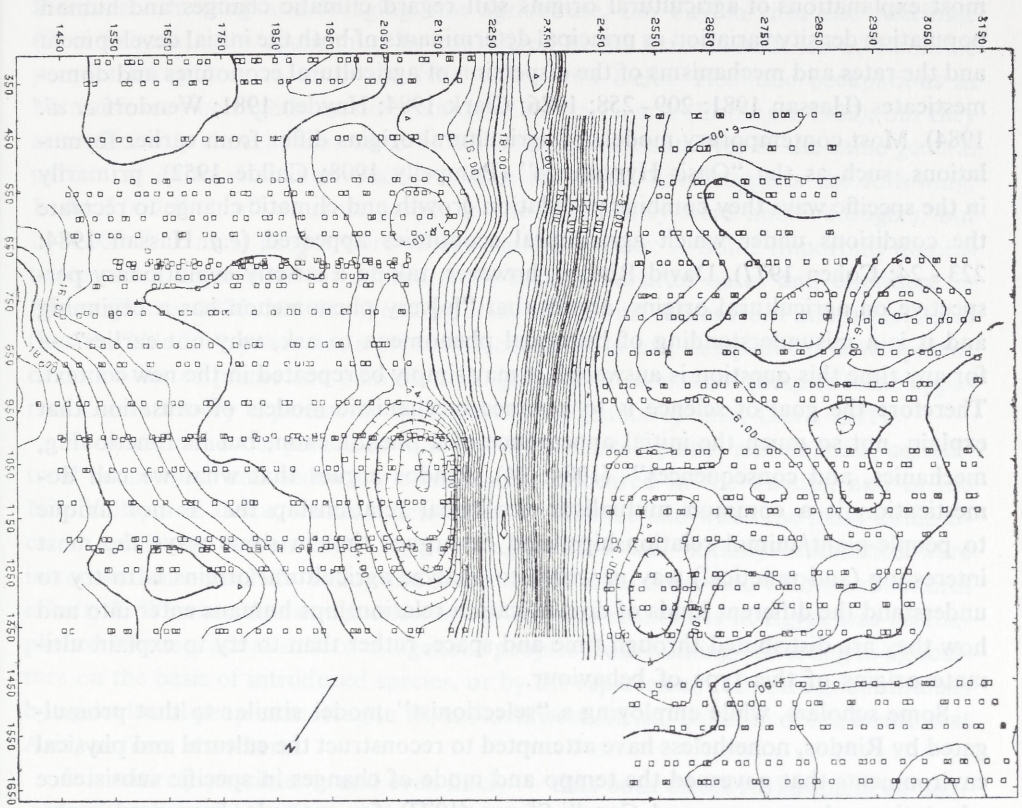

FIG. 2. Sampling design for surface collections at sites FS-1 (Neolithic) and FS-2 (Epipalaeolithic)
Each square represents a 5 × 5 m square in which all surface artifacts were collected. The vertical axis is in direction of the present lake.

As applied to the specific case of Egypt, there are several aspects of these debates about the nature of agricultural origins that are particularly relevant to our analyses of the Fayum data. Agricultural economies apparently appeared in the Nile Valley and Delta at least 3000 years later than they did in Southwest Asia, even though these Egyptian environments possessed enormous agricultural potential and indige-

nous species capable of domestication. Thus we might look to Egypt for examples of the factors that controlled both the rate and the mechanisms by which agricultural economies were established in different areas. It should be of some significance, for example, that the basic wheat barley-sheep goat form of agriculture took approximately as long to be incorporated in fully-agricultural economies in Egypt as they did in Central Europe, despite the fact that Egypt is so much closer in space and more similar in environment to the supposed centers of initial domestication of these species.

Before considering the Fayum data in this context, it should be noted that today most explanations of agricultural origins still regard climatic changes and human population density variation as principal determinants of both the initial development and the rates and mechanisms of the dispersion of agricultural economies and domemesticates (Hassan 1981: 209 - 258; 1986; Clark 1984; Hayden 1981; Wendorf *et al.* 1984). Most contemporary models of agricultural origins differ from earlier formulations, such as the "Oasis Hypothesis" (Pumpelly 1908; Childe 1952), primarily in the specific ways they combine population growth and climatic change to recreate the conditions under which agricultural economies appeared (*e.g.* Hassan 1984: 223 - 24; Cohen 1977). David Rindos, however, taking a strictly evolutionary perspective on agricultural origins, argues that "[e]very phenomenon has a beginning and it is a misunderstanding of historical phenomena to ask, why not earlier? — for any time this question is answered, it may simply be repeated in the new context. Therefore the goal of science is to advance mechanistic models of causation that explain, not so much the initial appearance of a phenomenon, but its functioning, mechanics, and consequences" (1984: 34). Rindos argues that what we call domestication is a common mutualistic ecological relationship that is not unique to people-plant/animal relationships, and he argues that in some ways the most interesting (and practical) way in which to analyze agricultural origins is to try to understand the different kinds of domestication relationships humans enter into and how they are distributed through time and space, rather than to try to explain ultimate origins of this type of behaviour.

Some scholars, while employing a "selectionist" model similar to that promulgated by Rindos, nonetheless have attempted to reconstruct the cultural and physical environments that governed the tempo and mode of changes in specific subsistence adaptations. Ammerman and Cavalli-Sforza (1977), for example, have used evolutionary models to analyze the spread of agriculture from Southwest Asia into Europe. To explain the timing of the appearance of agricultural economies, Hassan (1981: 225) stresses the role of "microclimatic fluctuations" attendant on the end of the Pleistocene and in the context of increasing human technological sophistication, as well as changing demographic and socio-economic conditions, and, perhaps increasing human cognitive abilities.

Our approach here is somewhat similar. We are trying to place the Fayum in the context of the spread of agricultural economies about 7,500 years ago, both

in terms of the origins of this form of subsistence and the selective environments that determined when and where this adaptation would appear. We hope that our knowledge about the specifics of early Egyptian agriculture will provide useful test of more general models, such as that proposed by Rindos (1984).

Early Egyptian agriculture

With the recent reassessment of the Wadi Kubbaniya data as reflecting late Pleistocene hunting and foraging, not agriculture, the Fayum sites and Merimde (Beni Salama) once again must be considered as the earliest evidence of Neolithic peoples living near to or in the Nile Valley and Delta. Neolithic occupations at Merimde may be slightly earlier than those in the Fayum (Eiwanger 1982), but they are sufficiently close in time as to be considered representatives of the same general pattern of cultural change. Such evidence as we do have suggests the following: 1. At 7,000 B.C. all or most people in the Nile Valley were hunter-foragers, but by 4,000 B.C. most people were village agriculturalists; 2. Some important domesticates were apparently introduced from eastern Saharan oases and elsewhere in Africa (Butzer 1976: 10 - 11; Wendorf *et al.* 1984), and others from Southwest Asia; thus the Nile Valley was not a primary location of *in situ*, independent development of domesticated plants and animals and agricultural economies (despite some apparent domesticatory experiments with several indigenous species, Clark 1971).

To understand the processes whereby domesticated plants and animals, agricultural economies, and sedentary communities appeared in the Fayum, and in the Nile Valley and Delta, we must determine: 1. Whence and when the main domesticated species on which early Egyptian agriculture was initially established were introduced into the Nile Valley and Delta and in what order and with what cultural effects; 2. Whether the introduction of agricultural economies in Egypt was accomplished by the gradual shift of indigenous peoples from hunting-collecting to agriculture on the basis of introduced species, or by the replacement of non-agriculturalists by agricultural peoples moving in from Northwest Africa, Saharan oases, Southwest Asia, or from elsewhere.

It is entirely possible – and even likely – that both direct replacement of non-agriculturalists and the "conversion" of hunter-collectors to agriculturalists occurred, and that important domesticates and other cultural influences came from several different areas, such as Southwest Asia, Northwest Africa, and Saharan oases. Thus the problem of understanding early Egyptian agriculture is almost certainly one of establishing degrees of significance of various factors in a complex multivariate pattern of cultural and environmental interaction. But some preliminary questions must be answered before we can even begin a comprehensive analysis of these complex interactions. For example, if agricultural peoples, dependent on domesticated wheat, barley, sheep, goats, cows, and other plants and animals,

moved into Egypt from South west Asia and displaced or assimilated local hunters and gatherers in a gradual process, the remains of their communities in the eastern Delta and northern Nile Valley may have been destroyed or buried beneath the alluvium by subsequent floods. If so, agricultural communities in the Fayum and at Merimde would likely be relatively late manifestations of the shift to agriculture in Egypt and are now considered early only because of the accidents of preservation (in the case of the Fayum, Ptolemaic-period rulers severed the connections between the Fayum lake and the Nile, thereby greatly reducing the level of the Birket Qarun and stranding the Neolithic and Epipaleolithic sites in the desert). The early agricultural communities in the Fayum, at least, may have been marginal adaptations, where hunting and gathering remained an important part of the economy long after agriculture was also practiced. In contrast, communities in the Nile Valley at this time, where there was greater potential for agricultural (tied to annual siltation and the possibilities of irrigation), may have evolved economies more narrowly and productively focussed on agricultural products (Clark 1971; Hassan 1985; 1986 n.d.; Butzer 1976: 8 - 11).

But our interpretation of the significance of the Fayum data perhaps would be entirely different from the above reconstruction, if the most important domesticates and agricultural economies were established there by peoples moving in from Northwest Africa and the Saharan oases rather than from Southwest Asia. Various scholars have suggested that groups in the Western Sahara developed an essentially Neolithic economy based on domesticated cattle – perhaps of species originating from southern Africa – and intensive plant use in oases environments, and that they eventually moved into the Fayum and the western margins of the Nile Valley. Once there, they may have been able to add to their economy domesticated cereals and sheep/goats and other animals (which may have been available as minor parts of the economy by the late Epipaleolithic), thereby displacing, assimilating, or replacing indigenous hunter-collector groups. From this early establishment in the Fayum, at Merimde, and at other communities along the western edge of the Delta and Valley, agricultural economies would have quickly spread into the Delta and Valley and become more fully agricultural than those in the Fayum, by virtue of the greater agricultural potential of the Delta and Valley proper.

Regarding this last reconstruction, Butzer has argued that "The sum total of the evidence... favours an introduction of the Neolithic (in Egypt), but from a northwestern rather than a northeastern source. The new groups involved were intrusive, but they were North African, and they may have come from the oases of the northern Libyan desert or further west in the Sahara, or along the Mediterranean littoral" (1976: 11). Trigger, on the other hand, emphasizes the importance of southwest Asian domesticates and cultural influences, suggesting, for example, that "... even if Egyptian domesticated ısg and cattle were bred from North African wild ancestors, the idea of their domestication must have come from south-west Asia..." (1983: 20).

Hassan suggests that the primary stimulus to agricultural origins was a period of severe aridity after about 6,700 B.P. that "... most likely led to the gradual depopulation of the desert and the infiltration of the Nile Valley by individuals and families in a manner not unlike the modern dispersal of the Sahel peoples... Similar aridification seems to have affected the Sinai and Negev, and a similar movement toward the Nile is plausible. This was no mass invasion, but a gradual infiltration by drifters and refugees over a period of about 500 years or more. These groups mingled easily with the local inhabitants of the Nile Valley, who were at that time hunters, gatherers, and fishers... Agriculture therefore did not displace the pre-existing subsistence patterns but supplemented it. The change in subsistence was almost imperceptible peaceful, and gradual" (1984: 222).

Wendorf and Schild recently have reported numerous Neolithic communities based on cattle-raising and extensive (but undetermined) plant use in oases in the eastern Sahara, beginning as early as 9,800 B.P. (1984: 409). These communities seem to coincide with several periods of significantly increased rainfall. Wendorf and Schild conclude that: "Both cattle and pottery seem to have been known in the Sahara as early as anywhere else in the world. We believe, however, that they were brought in from elsewhere by the first Holocene colonists, as part of the response to their precarious environment, and not that domestication and ceramic technology were actually invented there. We would not suggest that the Holocene Sahara was an area of great innovation, but as an area of adaptation it is perhaps unsurpassed" (1984: 428).

If agriculture was, indeed, mainly introduced from the eastern Saharan oases and Northwest Africa, the Fayum may have been among the earliest areas so occupied, and may have been, in fact, the area in which the Saharan Neolithic economies were combined with Southwest Asian domesticates to produce the fully-agricultural economies that quickly formed the basis for initial Egyptian cultural complexity.

In looking at the sources and timing of early Egyptian agriculture, we must also consider the concept of "preadaptation". Preadaptation to agriculture by hunter-collectors has been suggested for other areas where agriculture was introduced, such as in the aboriginal North American southeast. Before the appearance of agriculture based on maize, beans, and squash in this area, the inhabitants exploited various "starchy seeds" (*e.g. Chenopodia*) in a manner that suggests domestication and even agriculture. Rindos (1985) suggests that the timing of the appearance of maize-based agriculture in this region depended on the preadaptation of these people to habitual plant use, the development of a technology of seed gathering, processing, storage, and so on. A similar concept of preadaptation has been applied to early agriculture Egypt by Clark (1971), among others, and in the Sudan by Caneva (1983). Hunting and gathering peoples of the Delta and the Nile Valley may have developed a technology and subsistence strategy that "preadapted" them to agriculture, so that the timing of the appearance of agricultural economies in Egypt was determined in large

part by the degree of "preadaptation" in the Fayum, the Delta, and the Nile Valley, and that agriculture subsequently spread at a rate and direction determined by the economic advantages of agriculture over local adaptations.

The Fayum data

Considerable additional data and analyses will be required before we can identify the origins of the domesticates of the Egyptian Neolithic and the processes by which they were incorporated into Neolithic economies throughout the Nile Valley. Data from the Fayum, however, are relevant to several of these issues.

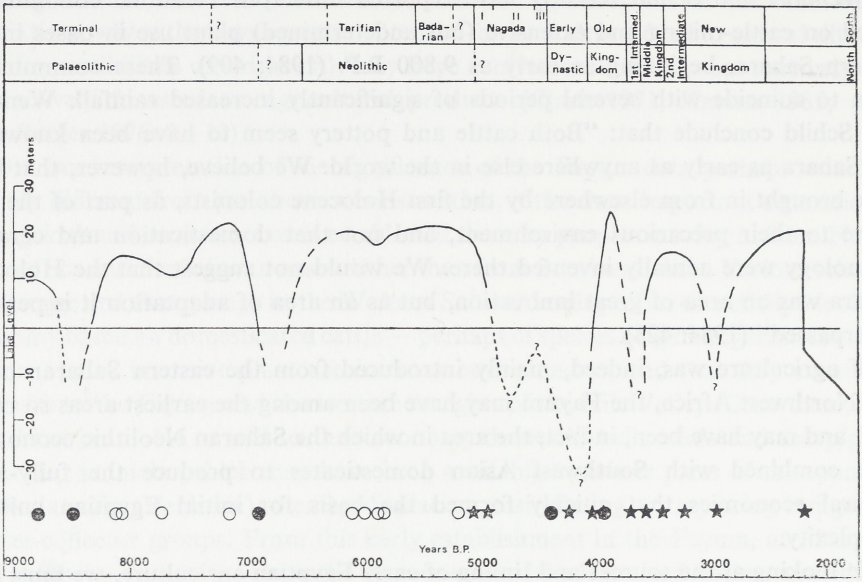

FIG. 3. Reconstruction of Fayum Lake levels (after Hassan, in press)
The symbols are used as follows: circles – radiocarbon dates; hexagons – stratigraphic evidence; rectangles – historical evidence

To begin with the problem of the chronology of human habitation of the Fayum, we must consider first the physical environment of the ancient Fayum Depression. Fayum lake levels have been studied by many scholars (reviewed in Wendorf and Schild 1976: 155 - 162; Hassan 1986). It is generally acknowledged that the primary determinant of early human occupation in the Fayum has always been the lake, the Birket Qarun, but there seems little doubt that at various times there was sufficient rainfall that the eastern Sahara, including the desert margins of the Fayum, were much richer in floral and faunal resources than at present. Studies in southern Egypt, such as at Bir Kiseiba (Wendorf *et al.* 1984), indicate significant population

densities in areas that are now – and for many millennia have been – too arid for occupation.

The most recent reconstruction (Fig. 3) of lake levels – that by Hassan, done in connection with our 1981 fieldwork – illustrates the role of the lake in determining the origins of agricultural economies in the Fayum. If one considers the distribution of known settlements in the Fayum (Wendorf and Schild 1976; Wenke *et al.* 1983), it seems likely that the Fayum was virtually abandoned in the Predynastic, Old Kingdom, and early New Kingdom periods. These time intervals correlate well with markedly reduced lake levels. In contrast, population densities were relatively high in the Epipaleolithic, Neolithic, Middle Kingdom, and Late New Kingdom periods, all of which were times of relatively high lake levels.

Table 1

Histogram of radiocarbon dates from Fayum sites

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
4900	1	*
5100	3	***
5300	4	****
5500	5	*****
5700	2	**
5900	3	***
6100	2	**
6300	4	****
6500	1	*
6700	0	
6900	0	
7100	1	*
7300	0	
7500	2	**
7700	2	**
7900	0	
8100	2	**
8300	1	*
8500	0	
8700	0	
8900	1	*

All dates are in radiocarbon years BP, uncorrected; these dates are listed with error factors and source in Hassan (in press).

It should be noted that this strong correlation between lake levels and population densities may also have to do with the agricultural potential of the Fayum *vis-à-vis* that of the Nile Valley proper. Under conditions of reduced Nile floods, agricultural lands of the Fayum may have been more severely affected than those in the Delta and Valley. The amount of fertility-renewing silts and sediments borne by the flood waters would probably have been greater in the valley than in the Fayum basin, since these sediments would have been partially precipitated in the channel connect-

ing the Nile and the Fayum basin. Also, the extremely shallow slope of the southern and western Fayum basin would have meant that fluctuation in lake levels would radically alter the extent of areas covered by water. Although extensive irrigation works were constructed in the Fayum in Ptolemaic times, there is no evidence of their use in earlier periods, and thus farmers of pre-Ptolemaic times would have been directly dependent on the extent and richness of lands exposed by receding flood waters.

If, as Fig. 3 suggests, Fayum lake levels decreased sharply in the transitional period between Epipaleolithic and Neolithic occupations (at about 4,800 B.C.) this may have been sufficient to displace indigenous hunter-gatherers and thereby render the Fayum an "open-niche" for agriculturalists. Presumably, hunter-gatherers would have been drastically affected by either a sudden lowering of the lake, which would strand the gallery-forests of the lake margin in the desert, or by rising lake levels, which would drown these forests and their associated floral and faunal communities.

In this context the distribution of radiocarbon dates from many different Fayum sites (Table 1) is quite interesting. It is possible that sites that have been destroyed or not yet located account for the gap between Epipaleolithic and Neolithic sites in Fig. 4, but on the basis of our surveys we regard this possibility as remote.

The source of Fayum Neolithic cultures

The primary evidence we have to test the alternative possibilities of direct colonization as opposed to indigenous cultural change in the Fayum during the Epipaleolithic – Neolithic transition is variability in artifact styles. Presumably, if agriculturalists colonized the Fayum and either replaced or displaced hunter-collectors, their lithics and ceramics would show similarities to those in their original territories. Unfortunately, the geographical distributions of Fayum A- and B-style assemblages are not well-known. The distinctive hollow-base points found in Fayum A assemblages seem to exhibit considerable stylistic expression, but this variability has never been precisely mapped in time or space. Caton-Thompson and Gardner examined the possibility that this lithic style originated in Wadi el-Arish, Kharga Oasis, and other sources, but concluded that there is no convincing evidence, and that the "... possibility of an autochtonous Delta origin should not be dismissed and in many ways appears the most satisfactory provisional guess" (1934: 94).

But there are many other possibilities. The apparent lack of sites indicating the development and dispersion of the styles associated with the Fayum A assemblages may be a result of site destruction and alluviation in the Nile Valley. Wendrof and Schild (1984: 515), for example, suggest now-obscured sites in the Nile Valley as a likely source for the very early Holocene Neolithic cultures they describe in the

Bir Kiseiba areas of the eastern Sahara. It is possible that the later Neolithic cultures of the Fayum derive from a similar source. On the other hand, Wendorf and Schild suggest: "... some sort of Saharan-Nilotic interaction may be indicated by the presence of numerous Late Neolithic sites associated with playas in the Sand Sea. These sites contain fiber-tempered pottery and hollow-based bifacial arrowheads, closely resembling those of the Fayum A Neolithic (R. Kuper, personal communication). Fayum A has long seemed very different from Neolithic complexes in the adjacent Nile Valley, particularly in its pottery, and the presence of Fayum A-like sites in the Sand Sea raises the possibility that the Fayum A may have been the Saharan groups who moved to the Fayum basin seasonally in order to fish. This would presumably have occurred in late summer after the flood. The Sand Sea sites must be dated and compared in detail with the Fayum A sites before this can be regarded as more than a suggestion..." (Wendorf *et al.* 1984: 428).

In our analyses of the Fayum artifacts we considered ways in which to test the common assumption that the Fayum A and Fayum B lithics are sufficiently distinctive stylistically that, even allowing for changes attendant on the transition from a hunting and gathering strategy, two culturally distinct groups of people are indicated. Our research on this topic has just begun, but we hope to make wide-ranging comparisons between our assemblages and those from the eastern Sahara and elsewhere. Long (personal communication), in analyzing the differences in size and shape of debitage and tools between Fayum A and B assemblages, has stressed that lithic reduction strategies are related to the size, shape, quality, and abundance of available raw materials. Small size lithics with high length breadth ratios (*e.g.* blades) maximize the amount of cutting edge produced per unit of raw material. Thus, the arrival of a new population in the Fayum is perhaps not a complete explanation for the change from the small blade industry of Fayum B to the larger flake industry of Fayum A. It is entirely possible that a change in the source of the raw materials used in these two industries is an important factor in the observed changes in lithic tool shapes and sizes. There seems to be, for example, a somewhat higher frequency of a close-grained, light coloured flint in the Fayum A sites, but this greater frequency may have to do with the need in a Neolithic economy for certain large cutting tools.

Much additional stylistic analysis of the Fayum lithics and ceramics will have to be accomplished before we can make significant comparisons of these artifacts with other assemblages, and we hope to publish these comparisons in our final report (Wenke and Lane [eds.] in preparation).

Another form of evidence concerning the alternative possibilities of colonization *vs.* indigenous development is the sample of radiocarbon dates illustrated in Table 1. If the Neolithic occupations represent a new group moving into the area after, perhaps, depopulation during the Epipaleolithic as a result of high or low flood levels, we might expect to see the radiocarbon dates occur in two clusters, separated by a period when there were no occupations. Alternatively, if agriculture was a matter of indigenous development, or a slow refocussing of the local economy on introduced

domesticates, we would expect to see a continuum of dates spanning the transitional period.

Too few dates have been produced to test these ideas definitively, but the pattern in Table 1 suggests some separation in time between Fayum B and A sites. Pazdur interprets the dates on materials recovered by the Polish mission to Qasr el-Sagha as indicating two phases of Neolithic habitation: "The first phase... called Unit I, lasted from 5,000 B.C. ... to about 4,400 B.C., while the second phase... lasted from *ca.* 4,330 B.C. to 3,900 B.C. (1983: 117). Pazdur conjectures that these different periods may be associated with dramatic climatic changes, in which the level of the lake or the amount of rainfall in the surrounding deserts altered sufficiently to affect settlement distributions.

The dates presented in Table 1 make this interpretation possible but by no means inescapable. If we do accept the pattern in Table 1 as indicative of two periods of Neolithic occupation, we would then have to associate this discontinuity with either alterations in lake levels or precipitation rates, or with cultural factors, such as, perhaps, the introduction of Southwest Asian domesticates.

To a limited extent, the questions of from where Fayum agriculture originated and how can be addressed by examining the economy and settlement patterns of Fayum Epipaleolithic and Neolithic sites. If, for example, Fayum agriculture developed out of the migrations of Saharan cattle-raisers, as suggested by Wendorf and Schild (1984: 428), we might expect the settlement patterns and animal exploitation practices of both groups to show considerable resemblance – modified, of course, by the unique aspects of the Fayum's lacustrine resources. If, on the other hand, hunter-collectors who were "preadapted" to agriculture by intensive exploitation of Fayum plant and animal populations were transformed into agriculturalists by the introduction of domesticated species from Northwest Africa or Southwest Asia, we would expect to see this reflected in the kinds of exploitation and settlement pattern changes attendant on the Epipaleolithic-Neolithic transition.

To consider this latter point first, there is little in the available evidence, either from our own research or that of others, to indicate that the Epipaleolithic peoples of the Fayum were somehow "preadapted" to agriculture through millennia of systematic plant and animal use. Although few botanical remains have been recovered from Fayum Epipaleolithic sites, those that have been reported are principally field weeds that cannot have had especial significance as foods (Wetterstrom, personal communication). Moreover, there is no indication of Epipaleolithic Fayum encampments having achieved the permanence that those based on seed-collecting in other areas did; all Epipaleolithic sites now known in the Fayum are the artifact scatters one would expect from frequent movements of small groups. Wendorf *et al.* (1984: 414) in fact comment specifically on the great contrasts between the Fayum B, or Qarunian, small "fishingcamps" and the much more substantial contemporary communities in the eastern Sahara.

Nowhere in the Fayum do we find overlying levels that span the period of the

transition and show a gradual change in settlement type. Perhaps more significantly, there are few or no grinding stones asociated with Epipaleolithic sites in our sample, yet such implements are common in association with Neolithic occupations.

Yet some aspects of the economy indicate continuity between Epipaleolithic and Neolithic adaptations in the Fayum. Brewer (1984) reports that the kinds of fish exploited and the seasonality of their exploitation varied extermely little when Epipaleolithic and Neolithic sites on the northern Fayum shore are compared. Until the era of systematic over-exploitation, fish in the Fayum were a reliable, predictable resource, the exploitation of which probably would have required no major rescheduling of agricultural activities or any new technologies.

On the other hand, the relative rate of caloric return from cereals is usually so high that even subsistence farmers in areas with rich aquatic resources typically quickly focus most of their economy on the reliable, prolific cereals, and in some cases seem to ignore entirely the rich aquatic resources they had once depended upon (Tauber 1981).

The weights of the faunal remains of the various taxa recovered in our 1981 season are presented in Table 2, based on approximately an 80% sample of the remains from Neolithic sites, and from the single Epipaleolithic and "Predynastic" sites investigated. It is clear that in both the Epipaleolithic and Neolithic periods massive

Table 2

Weights of faunal remains of selected taxa from three Fayum sites

Site	FS-1 (Neolithic)		FS-2 (Epipaleolithic)		FS-3 (Predynastic)	
Taxa (weight:grams)		%		%		%
Indentified Fish	5541.3	29.9	47.7	2.6	4458.8	20.0
Unidentified Fish	4101.6	22.1	735.5	40.0	9538.3	42.6
Turtle	2351.3	12.7	11.1	0.6	625.7	2.8
Crocodile	13.3	0.1		0.0	1244.9	5.6
Bird	29.1	0.2	29.9	1.6	23.8	0.1
Hartebeest	18.9	0.1	132.2	7.2	146.8	0.7
Gazelle	65.0	0.4	2.5	0.1	180.9	0.8
Canid	21.2	0.1	.6	0.0	243.6	1.1
Cattle	3.9	0.0	224.9	12.2	14.1	0.1
Sheep/Goat	131.7	0.7		0.0		0.0
Addax		0.0	86.3	4.7		0.0
Pig	.1	0.0		0.0		0.0
Unidentified Mammal	6265.3	33.8	566.9	30.9	5907.2	26.4

1. Many other species have been identified in the 1981 Fayum faunal assemblages, and these will be fully published in our final report, along with more detailed information about differential frequencies of body parts in some species and measurements on selected faunal elements;
2. The fauna from FS-1 are from surface collection while those from FS-2 and FS-3 are from excavations, so these data are not directly comparable;
3. The data for FS-1 represent the faunal remains recovered in approximately 80% of the surface collections· the remaining 20% will be published in our final report;
4. The primary fish species represented in our collections were *Clarias*, *Synodontis*, *Tilapia*, *Lates*, *Bagrus*, and *Tetradon*;
5. FS-3 was identified as Predynastic by Caton-Thompson and Gardner and located to the southwest of the Ptolemaic site of Philoteris (1934: Pl. CVIII).

quantities of fish were eaten (primarily *Clarias* and *Heterobranchus*), as well as turtles, crocodiles, antelopes, gazelles, aurochs, hares, and various invertebrates. As for the use of domesticates in the Fayum Neolithic, the evidence is somewhat ambiguous. The small representation of domestic sheep, goats, and cattle in the sites analyzed in our 1981 work indicates a very restricted role for these animals, but the bovids may have been used in the Nilotic Saharan tradition of milk and blood exploitation, rather than as primarily a meat source (Wendorf and Schild 1984: 428). And some of the bovids in our samples may be from wild populations of this genus: Gautier, in his discussion of the faunal remains from Neolithic sites on the northern Fayum shore (1976), suggests that at least some of the cattle remains there were from wild populations.

It is somewhat curious that the pig – which may be presumed to have lived in great numbers in undomesticated form in the swamps and lake margins of the Fayum – has been tentatively identified at one of our Epipaleolithic sites but appears to be either absent or uncommon in Neolithic sites in the southwestern Fayum. Caton-Thompson and Gardner reported pig-remains from Kom W, a major Neolithic site on the northern Fayum shore, although they note that these pigs may not have been domesticated, and indeed, they doubted that "... domestic animals played much, if any part, in this lake side economy" (1934: 89).

These and other aspects of the cultural ecology of the Fayum should become somewhat clearer when we have finished our statistical analyses of the associations between the faunal remains and artifacts.

Regarding the Neolithic settlement pattern, our statistical analyses of artifact distributions on the southwestern edge of the Fayum are still in process, but there is little in our initial findings to indicate the existence of permanent villages. Residences of the Fayum A peoples may well have been insubstantial reed huts, of course, and, if so, we would expect to find few evidences of these. But even such simple structures would probably have produced distinctive artifacts distributions and associated features, such as storage bins, graves, and specialized activity areas. There is little in the archaeological record of the Fayum to support the notion of permanent Fayum villages, however. Kom W, the largest Fayum A site in the Fayum, had several meters of occupational debris at its maximum height, but Caton-Thompson and Gardner found not a single recognizable wall-trench, housefloor, or structure. Kom W seems to have been produced by hundreds of small encampments around hearths and probably spanned several centuries of such episodic occupations.

It is in this context that we have examined closely the conclusion of Ginter and Kozłowski (1983) that some sites on the northern Fayum shore are the remains of "dwelling structures" of Neolithic agriculturalists. Their maps (1983: Fig. 22) of these settlements show post-holes in position near hearths and other domestic remains. They also distinguish two Neolithic periods (an earlier Neolithic I and a later Neolithic II), and they conclude that the "Neolithic character of Unit I, that is its agricultural-breeding economy, is revealed only in the large base camps

such as Kom W, while the sites discovered in the Qasr el-Sagha region represent rather seasonal (dry-season) specializations based mainly on "fishing" (1983: 70).

The grinding stones, sickles, plant and animal remains, and other artifacts at Kom W leave no doubt that these people used domesticated plants and animals and practiced agriculture. But Kom W, by far the largest and stratigraphically complex of the known Fayum A sites, does not at all resemble Neolithic communities in most other areas of the world: there is little convincing evidence of post-holes, floors, burials, houses, storage bins, or other markers of year-round settlement in an agricultural community. Nor are there indications in Puglisi's (1967) analyses of sites in the extreme northern part of the Fayum Depression of sedentary agricultural communities.

In fact, none of the known Fayum A sites closely resembles permanent agricultural communities. This lack of resemblance may be an artifact of poor preservation or inadequate sampling, but at this point it seems clear (as various scholars, beginning with Caton-Thompson and Gardner 1934, have suggested) that the Fayum A adaptation was quite different from other Neolithic adaptations, and that the Fayum A peoples remained somewhat mobile, even after they had begun substantial agriculture and stock-breeding.

If this was the case, the importance of the Fayum Neolithic may be in what it can tell us about the association of agriculture and the village way of life, as well as in its evidence about the timing and spread of agricultural economies.

The association of full-fledged agricultural economies with sedentary populations and permanent village life is not absolute, but it is quite close. There are good reasons for this. Cereal crops have relatively short periods of optimum maturation for harvesting, and competition for the ripened seeds from birds, rodents, and other animals is severe (Flannery 1973). Immediate storage of gathered cereals is required to avoid enormous losses to animals and spoilage, and both the stored grain and the technology for collecting and processing it is not easily portable. So why would the Fayum Nelithic population have remained quite mobile, if indeed they did?

If the Fayum Neolithic derived from Saharan sources, as Wendorf *et al.* (1984) suggest, they may have continued the Saharan tradition of cattle-exploitation coupled with a diverse hunting-collecting, agricultural economy. Whatever the ultimate source of the colonists or domesticates, the Fayum's low agricultural potential *vis-à-vis* that of the adjacent Nile Valley (prior to the exposure in Ptolemaic times of the rich Fayum lake bottom) may simple have offered a better return on a mixed agricultural-hunting-collecting economy that a fully agricultural one.

We hope that additional analyses of our data will help resolve these questions. Ultimately, of course, the archaeology of the Faytum can only be interpreted in the context of the archaeology of other areas, including the eastern Sahara, Sinai, the eastern Delta, and the southern Nile Valley – the areas from which domesticates and agricultural economies may have been initially introduced to the Fayum.

References

Ammerman, A. and L. Cavalli-Sforza. 1977. The wave of advance model for the spread of agriculture in Europe. In: K. Cooke and C. Renfrew (eds) *Transformations: Mathematical Approaches to Culture Change*: 275 - 93. New York: Academic Press.

Binford, L. R. 1968. Post-Pleistocene adaptations. In: S. R. and L. R. Binford (eds) *New Perspectives in Archaeology*: 313 - 41. Chicago: Aldine.

Brewer, D. J. 1986. *Cultural and Environmental Change in the Fayum, Egypt: An Investigation Based on Faunal Remains.* Doctoral Dissertation, University of Tennessee, Knoxville.

Buck, P. 1984. *Archaeological research at Site T, a Neolithic site in the northern Fayum.* Paper read at the annual meeting of the American Research Center in Egypt New York.

Butzer, K. 1976. *Early Hydraulic Civilization in Egypt.* Chicago: University of Chicago Press.

Caneva, I. 1983. Pottery Using Gatherers and Hunters at Saggai (Sudan): Preconditions for Food Production. (Excavating Saggai I). *Origini* 12 : 7 - 29.

Caton-Thompson, G. and E. Gardner. 1934. *The Desert Fayum.* London: Royal Anthropological Institute.

Childe, V. G. 1952. *New Light on the Most Ancient East.* 4th Edition. New York: Grove Press.

Clark, J. D. 1971. A re-examination of the evidence for agricultural origins in the Nile Valley. *Proceedings of the Prehistoric Society* 37 : 34 - 79.

– 1984. The domestication process in Northeast Africa: ecological change and adaptive strategies. In: L. Krzyżaniak and M. Kobusiewicz (eds): 25 - 41.

Cohen, M. 1977. *The Food Crisis in Prehistory.* New Haven: Yale University Press.

Eiwanger, J. 1982. Die neolitische Siedlung von Merimde-Beni Salame. Vierter Bericht. *Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo* 38 : 67 - 82.

Flannery, K. V. 1973. The Origins of Agriculture. *Annual Review of Anthropology* 2 : 271 - 310.

Gautier, A. 1976. Animal remains from archaeological sites of Terminal Paleolithic to Old Kingdom age in the Fayum. In: F. Wendorf and R. Schild (eds), *Prehistory of the Nile Valley*: 369 - 380. New York: Academic Press.

– 1984. Archaeozoology of the Bir Kiseiba Region, Eastern Sahara. In: F. Wendorf, R. Schild (assemblers) and A. E. Close (ed.), *Cattle-Keepers of the Eastern Sahara. The Neolithic of Bir Kiseiba*: 49 - 72. New Delhi: Pauls Press.

Ginter, B. and J. K. Kozłowski. 1983. Investigations on Neolithic Settlement. In: J. K. Kozłowski (ed.), *Qasr el-Sagha 1980*: 37 - 67. Warszawa–Kraków: Państwowe Wydawnictwo Naukowe.

Hassan, F. A. 1981. *Demographic Archaeology.* New York: Academic Press.

– 1984. Toward a model of agricultural developments in Predynastic Egypt. In: L. Krzyżaniak and M. Kobusiewicz (eds): 221 - 224.

– 1985. Radiocarbon chronology of Neolithic and Predynastic sites in Upper Egypt and the Delta. *The African Archaeological Review* 3 : 95 - 116.

– 1986. Desert environment and the origins of agriculture in Egypt. *Norwegian Archaeological Review* 19(2) : 63 - 76.

– in press. Holocene Lakes and prehistoric settlements of the western Fayum Egypt. *Journal of Archaeological Science.*

– n. d. Quaternary geology of the southwestern Fayum Egypt. In: R. Wenke and M. L. Lane (eds), *Land of the Lake: A Settlement History of Egypt's Fayum Oasis.*

Hassan, F. A., T. R. Hays, A. A. Hassan, J. Gallagher, A. Gautier and W. Wetterstrom. 1980. Agricultural development in the Nagada region during the Predynastic. *Nyame Akuma* 17 : 28 - 33.

Hayden, B. 1981. Research and development in the Stone Age: technological transitions among hunter-gatherers. *Current Anthropology* 22(5) : 519 - 48.

Kozłowski, J. K. (ed.). 1980. *Qasr el-Sagha 1980.* Warszawa – Kraków: Państwowe Wydawnictwo Naukowe.

Krzyżaniak, L. and M. Kobusiewicz (eds). 1984. *Origin and Early Development of Food-Producing Cultures in North-Eastern Africa.* Polish Academy of Sciences, Poznań Branch and Poznań Archaeological Museum.

Kuper, R. 1981. Untersuchungen der Besiedlungsgeschichte der östlichen Sahara. Vorbericht über die Expedition 1980. *Beiträge zur Allgemeinen und Vergleichende Archäologie* 3 : 215 - - 275.

Pazdur, M. 1983. Radiocarbon dating of organic samples. In: J. K. Kozłowski (ed.): 114 - 117.

Pumpelly, R. 1908. *Explorations in Turkestan: Expedition of 1904: Prehistoric Civilizations of Anau.* Carnegie Institute Publications No. 73.

Puglisi, S. M. 1967. Missione per Ricerche Preistoriche in Egitto. *Origini* 1 : 301 - 312.

Rindos, D. 1984. *The Origins of Agriculture.* New York: Academic Press.

– 1985. Public lecture. Seattle.

Tauber, H. 1981. ^{13}C Evidence for dietary habits of prehistoric man in Denmark. *Nature* 292 : 332 - 33.

Trigger, B. 1983. The rise of Egyptian civilization. In: B. G. Trigger B. J. Kemp and A. B. Loyd (eds), *Ancient Egypt; A Social History*: 1 - 69. Cambridge: Cambridge University Press.

Wendorf, F. and R. Schild. 1976. *Prehistory of the Nile Valley.* New York: Academic Press.

– 1980. *Prehistotry of the Eastern Sahara.* New York: Academic Press.

Wendorf, F., R. Schild (assemblers) and A. E. Close (ed.). 1980. *Loaves and Fishes: The Prehistory of Wadi Kubbaniya.* New Delhi: Pauls Press.

– 1984. *Cattle-Keepers of the Eastern Sahara: The Neolithic of Bir Kiseiba.* New Delhi: Pauls Press.

Wenke, R., P. Buck, J. Hanley, M. Lane, J. Long and R. Redding. 1983. The Fayum Archaeological Project: preliminary report of the 1981 Season. *Newsletter of the American Research Center in Egypt* 122 : 25 - 40.

Wenke, R. and M. E. Lane (eds). In preparation. *Land of the Lake: A settlement history of Egypt's Fayum Oasis.*